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Atari Announces Mega ST and PC Compatibles

by John Anderson

Atari made three hardware introductions at the Winter Consumer Electronics Show in Las Vegas. The first was in regard to the Mega ST series: a more professional, more compact, easier-to-expand version of its popular ST machine. The new model, which will be sold in 1, 2, and 4-megabyte configurations when it reaches computer specialty stores this spring. It features a small footprint, detached keyboard with a much better feel than its predecessor, a battery-backed real-time clock, a graphics blitter chip and a bus for plugging in add-on boards. The smaller footprint was achieved by packaging the CPU, floppy disk drive, and power supply in a module that serves as a pedestal for the monitor. Atari will also sell a stackable hard disk unit.

Atari also announced that it intends to make an all-out effort to sell to the growing desktop publishing market with an advanced system that will cost only half that of comparable products now on the market. In order to achieve this goal, the Mega ST computer will be matched with the new Atari Laser Printer. Atari's intention is to sell the complete system, including computer, printer, drive, and monitor, for under $3,000. The 300 dpi laser printer itself will sell for under $1500. Target for delivery is late spring.

Because of the speed and RAM power of the Mega ST, the laser printer can be software-driven; the result is that Atari can reduce the cost of the printer and still get greater versatility. Under software control via the ST, the laser printer can conceivably use any page description language and any type font.

The third introduction was the debut of the Atari PC, an IBM-compatible system including a computer, disk drive and monochrome monitor, priced at $699. Price of the system without a monitor is $499. The new computer has even more power and features than the IBM PC. Designed around the Intel 8088 chip, the switchable system performs at either 4.77 or 8.0 megahertz, and has 512K RAM memory, expandable to 640K on the motherboard. The system will be sold with a 5.25-inch floppy disk drive. It is the first IBM PC-compatible product that includes support for the EGA graphics mode as a standard feature. Other graphics modes supported by the custom-designed graphics chip are CGA, IBM monochrome and the Hercules graphics card. Also, Atari has built-in a Centronics parallel port for printers and an RS-232 serial port for modems and serial printers.

The unit will ship with a detachable IBM-style keyboard, a mouse, and mouse port. It will also be bundled with GEM desktop software from Digital Research. ●

ATARI PC

PC CLONE COMPARISONS

	ATARI PC	BLUE CHIP® PC	LEADING EDGE MODEL "D"®	EPSON® EQUITY™
CPU				
Main Processor	8088	8088	8088	8088
Clock Speed	8.0 MHz/4.77 MHz	4.77 MHz	8.0 MHz/4.77 MHz	4.77 MHz
8087 Ready	Yes	Yes	Yes	Yes
MEMORY				
Standard RAM	512K	512K	512K	256K
Expandable to	640K	640K	640K	640K
Dedicated display RAM	256K	64K	64K	4K
MASS STORAGE				
Disk Drive(s) (*)	5 1/4" (1)	5 1/4" (1)	5 1/4" (1)	5 1/4" (1)
Capacity	360K	360K	360K	360K
VIDEO DISPLAY				
EGA	Yes	No	No	No
CGA	Yes	No	Yes	No
Monochrome	Yes	Yes	Yes	Yes
Hercules	Yes	Yes	Yes	No
Mono Screen				
Columns x Lines	80 x 25	80 x 25	80 x 25	80 x 25
Max Std Resolution	720 x 348	720 x 348	720 x 348	640 x 200
Color Screen				
Columns x Lines	80 x 25	80 x 25	80 x 25	80 x 25
Max Std Resolution	640 x 350	640 x 200	640 x 200	640 x 200
Color Palette	64	16	16	16
Max on Screen	16	4	4	4
I/O				
Parallel (*)	Yes (1)	Yes (1)	Yes (1)	Yes (1)
RS232C Serial (*)	Yes (1)	Yes (1)	Yes (1)	Yes (1)
Mouse Port	Yes	No	No	No
Mouse	Yes	No	No	No
KEYBOARD				
Layout	PC/XT	PC/XT	Modified Selectric	PC/XT
Number of Keys	84	84	83	84
PRICE	$699.99*	$699.00	$1295.00**	$999.00***

* Price includes tri-sync EGA monochrome monitor.
** Price includes $100 TTL monochrome monitor and second disk drive.
*** Price includes $100 TTL monochrome monitor.

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Applying The Atari

by Jeff Brenner

This month we'll explore the Atari's player/missile graphics capabilities with Instant Atari Text, a routine that places colorful text columns over our Graphics 0 screens. We also have news, reader mail, and the "Changes/Additions" that were omitted from January's column.

News

For those of you interested in blackjack, Clarke Cant is offering a diskette of blackjack utilities. Cant says he is author of the book *Blackjack Therapy* and that the programs he developed makes use of formulas from a variety of blackjack books. The author encourges copying and distribution of the diskette and requests a $25 registration fee from users for updates (this type of software distribution is known as "shareware." Contact: Clarke Cant, 1409 S. 4th #206, Las Vegas, NV 89104.

Duplicating Technologies has announced the release of Revision 4.0 software for its 1050 Duplicator. The company says that the new diskette contains over 100 modules (each module can backup one particular program), including modules for Racing Destruction Set, World Karate Championship, Lode Runners Rescue, and Music Studio. Although Duplicating Technologies had promised that future software revisions would never cost more than $5.00, they're asking $13.95 for this one, and an additional $2.50 for shipping. Contact: Duplicating Technologies, 99 Jericho Tpke., Suite 302A, Jericho, NY 11735.

Happy Computers, meanwhile, wants you to turn your 1050 Duplicator Drive into a Happy Drive. When Happy's "Cheerup Upgrade" is installed in a Duplicator-equipped drive, the drive effectively becomes a Happy drive that can use Happy's Warp Speed Software and other Happy-compatible programs (but can no longer use the Duplicator software). The upgrade is $49.95. Contact: Happy Computers, P.O. Box 1268, Morgan Hill, CA 95037.

Back-issue diskettes of programs that have been featured in this column are no longer available from me, as I no longer have the time to fill these customized orders. However, Twenty-Fifth Century is now distributing a number of my programs (generally in special or enhanced versions) and a free Atari catalog is available to *Computer Shopper* readers. Contact: Twenty-Fifth Century, Software Division, P.O. Box 8042, Long Island, NY 11802.

Reader Mail

Dear Jeff,

I just read your answer to a reader's question in your January column, where you talked about making a character set of your own design, such as for script type. I remember reading about this when I first got my Atari, but could not understand the article then, and can't find it now. Could you explain how it's done?

D Lowe
Alexandria, Virginia

Perhaps for a future column I'll write a tutorial on redefining the Atari's character set, but I don't have room to go into detail this month. Basically, creating a new character set involves defining eight bytes of data for each of the 128 characters in the Atari's character set (the remaining 128 are the inverse of the first 128), placing it in memory on a 1K boundary, and poking location 764 with the high byte of the beginning of the character set data.

I'm sending you a diskette containing a public domain character set editor, with some predefined character sets. With this utility, you'll be able to easily create your own customized character sets for use in your BASIC programs, or in conjunction with a printing program as described last month. I'm also sending you a player/missile graphics editor. Player/missile graphics are another important aspect of the 8-bit Atari's graphics capabilities and this utility will

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Applying The Atari

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allow you to create color graphics "players" that can glide over the screen without disturbing the screens contents. (This month's program, in fact, makes use of player/missile graphics.)

Upon request, the character set editor and player/missile graphics editor utilities will be included on this month's diskette for other interested readers (see end of column for diskette information).

Dear Jeff,

I would like to know how to do a coldstart and a warmstart. I would appreciate this!

Kevin Medley
Riverdale, Georgia

Coldstart and warmstart (I'll forego the car jokes) are routines within the Atari's operating system (commonly labeled COLDST and WARMST) that properly initialize the computer when the power is turned on, or when SYSTEM RESET is pressed. Coldstart is executed upon powerup; when you turn your computer on, this is the first routine that is run by the computer. Coldstart clears all of the Atari's RAM by storing zeroes in every RAM memory location (otherwise the memory would be filled with residual data and/or random values). Additionally, this routine sets all of the Atari's registers and vectors to their default values. For example, a 148 is stored in location 710 to make the GRAPHICS 0 screen its standard blue color. Coldstart will then boot the disk in the drive or will perform a cassette boot if the START key is held down.

The coldstart powerup routine begins at ROM location 58487 ($E477). To "do" a coldstart from BASIC, you would type: A = USR(58487). The computer will then act as if you had turned it off and on again. Doing this is much easier on the computer's circuitry, in fact, than turning the power off and on, so if you're in BASIC and decide you want to boot a program, it's wiser to use A = USR(58487) instead of the power switch.

Warmstart is similar to coldstart, but the memory in the computer is not disturbed. The simplest way to see warmstart in action is to press SYSTEM RESET. You could also type A = USR(58484) since the warmstart routine begins in ROM at location 58484 ($E474).

A warmstart can be turned into a coldstart by storing a one in location 580: POKE 580,1. Location 580 serves as a flag that tells the computer whether or not it is in the middle of its powerup sequence. If you set this location to one and then press SYSTEM RESET, the computer will be tricked into executing its entire powerup routine instead of just the system reset routines, and you'll get a coldstart. This is, in fact, how a BASIC programmer can prevent others from pressing SYSTEM RESET and examining his program. If the BASIC program runs automatically and pokes location 580 with a one, anyone pressing SYSTEM RESET will cause the computer to powerup and reboot, thereby losing the program in memory.

Newsletter

The mail this month brings Runes, the newsletter of M.A.G.I.C., the Midwest Atari Group, Iowa Chapter (dues $15/year, P.O. Box 1982, Ames, IA 50010). Articles in the issue I received include "R.A.M.—Randomly Accessed Material" which discusses interesting items from other users' group newsletters and a review of Word Magic.

Enhanced Forms Generator Update

For those of you using the enhanced version of Forms Generator in the graphics mode: I have, to date, been informed of two printing problems in this mode that you may be experiencing depending upon your specific printer model, and your program serial number (the problems are corrected in later versions). When you load and print the INVOICE.FRM file included on the diskette, you should get a printout similar to the form reproduced on the back cover of the instruction guide. If your printout is either vertically compressed, or vertically expanded (with intermittent line feeds between printed graphics) return the diskette to me and it will be replaced. Please mention your printer model and interface in any correspondence regarding the program.

I am trying to make the graphics mode compatible with as many printers as possible. If you would like to use the enhanced Forms Generator with a printer that is not specifically supported by the program, send me photocopies of the graphics section of your printer manual and I'll let you know if a specialized printer driver can be created.

Missing Changes/Additions

The "Changes/additions" listing for the listed version of *Forms Generator* was omitted from the January column. O.K. folks, I've made my share of mistakes over the years, but this time the editorial department gets the blame. They occasionally like to pull a stunt like that. You'll find the listing under the "Changes/Additions" heading. In the future, if a portion of a listing is omitted due to lack of space or for other reasons, you can write Annda Kinsey, c/o *Computer Shopper*, for the listing.

Instant Atari Text

Now for this month's feature program. Instant Atari Text is a BASIC and machine language subroutine that lets you use player/missile graphics to put a column of colorful text on the screen. Best of all, this text can be quickly moved about the screen without disturbing the contents of the screen itself. You can use vertically oriented text to liven up your displays with animated messages, or just to add color to your Graphics 0 screens.

Using The Subroutine

Use Program Perfect to type in the listing under the "Instant Atari Text" heading and LIST the program to cassette or diskette (i.e. LIST "D:INSTANT.BAS"). Use LIST instead of SAVE since the LIST format will enable you to merge the subroutine with other BASIC programs.

To use the subroutine in your own programs, your program must first GOSUB 28000. This loads the machine language routine into memory and sets up the player/missile graphics. After a GRAPHICS command, use GOSUB 28020 if you want to continue using the Instant Atari Text.

Displaying The Instant Text

Once the routine has been initialized (with either the GOSUB 28000 or the GOSUB 28020) you can display up to four different columns of text on the screen at any time. The first step is to pick which column you want to utilize: 1, 2, 3, or 4. Variable PLR would be set to the particular column you want. Next, COL is loaded with the color that you want the text to be. Any of 128 colors can be used to display each column of text. To convert from the SETCOLOR com-

continued on page 238

INSTANT ATARI TEXT

```
LYJ 28000 DIM TX$(24),ML$(200):MEM=PEEK(106)
GMJ 28010 MEM=MEM-8:POKE 106,MEM:PLR=1
EAJ 28020 GRAPHICS PEEK(87)
GKJ 28030 POKE 54279,PEEK(106)
PEJ 28040 POKE 559,62:POKE 53277,3
SFJ 28050 POKE 623,1:RESTORE 28140
PKJ 28060 CNT=0:TOT=0
SJJ 28070 READ N:IF N=-1 THEN 28100
QIJ 28080 ML$(CNT+1)=CHR$(N):TOT=TOT+N+CNT
KMJ 28090 CNT=CNT+1:GOTO 28070
LZJ 28100 IF TOT=9635 THEN 28120
MQJ 28110 PRINT "ERROR-CHECK DATA":STOP
JLJ 28120 MEM=PEEK(106)*256+1024
ECJ 28130 N=USR(ADR(ML$),MEM):RETURN
QPJ 28140 DATA 104,104,133,205,104,133
JLJ 28150 DATA 204,162,4,160,0,168
QWJ 28160 DATA 145,204,200,208,251,230
PKJ 28170 DATA 205,202,208,243,96,104
QUJ 28180 DATA 104,133,205,104,133,204
QZJ 28190 DATA 104,133,207,104,133,206
MNJ 28200 DATA 104,104,133,203,160,0
POJ 28210 DATA 177,204,69,203,145,206
REJ 28220 DATA 200,192,8,208,245,96,-1
JTJ 28230 MEM=PEEK(106)*256+1048
CYJ 28240 IF PLR<1 OR PLR>4 THEN 28390
FSJ 28250 CHBAS=PEEK(756)*256
BKJ 28260 POKE 703+PLR,COL
PTJ 28270 POKE 53247+PLR,48+POS*4
VRJ 28280 PLR=(PLR-1)*256
HHJ 28290 FOR J=1 TO LEN(TX$)
MAJ 28300 K=ASC(TX$(J,J)):INV=0
DZJ 28310 IF K>128 THEN K=K-128:INV=255
FWJ 28320 IF K>96 THEN K=K+32:GOTO 28340
FLJ 28330 IF K<32 THEN K=K+96
HVJ 28340 K=(K-32)*8:N=CHBAS+K
KAJ 28350 N=CHBAS+K
YSJ 28360 A=USR(ADR(ML$(24)),N,MEM+J*8+PLR,INV)
CZJ 28370 NEXT J
OKJ 28380 PLR=PLR/256+1:RETURN
BBJ 28390 PRINT "PLR MUST BE SET AT 1, 2, 3 OR 4"
UHZ 28400 END
```

EXAMPLE 2

```
FZJ 10 GOSUB 28000
YSJ 20 TX$="  PRESS START TO BEGIN"
VIJ 30 COL=4*16+4:POS=0:GOSUB 28230
IYJ 40 TX$=" PRESS SELECT TO CHOOSE"
OLJ 50 COL=8*16+2:POS=39:PLR=2:GOSUB 28230
FCE 60 PRINT CHR$(125):POKE 82,8:PRINT :POKE 84,6:LN=6:DR=1:POKE 752,1
OPE 65 SETCOLOR 2,0,0
RQJ 70 PRINT "[1] FIRST CHOICE"
NLJ 80 PRINT :PRINT "[2] SECOND CHOICE"
LAJ 90 PRINT :PRINT "[3] THIRD CHOICE"
QEJ 100 PRINT :PRINT "[4] FOURTH CHOICE"
MCE 110 PRINT :PRINT "[5] FIFTH CHOICE"
RHE 115 POSITION 2,6:PRINT "--->"
OKJ 120 POKE 82,2:I=48
QCJ 130 CNSL=PEEK(53279):IF CNSL=7 THEN 180
YYJ 140 IF CNSL=6 THEN 200
COJ 150 IF CNSL<>5 THEN 180
FZE 160 SOUND 0,25,10,8:LN=LN+2:IF LN>14 THEN LN=6
TRE 165 POSITION 2,LN:PRINT "--->":IF LN>6 THEN POSITION 2,LN-2:PRINT "    "
YCJ 170 IF LN=6 THEN POSITION 2,14:PRINT "    "
IBE 180 I=I+DR:POKE 53248,I:POKE 53249,248-I:IF I<49 OR I>199 THEN DR=-DR
LIE 185 SOUND 0,0,0,0
BNJ 190 GOTO 130
VWJ 200 GRAPHICS 0:PRINT "CHOICE #";(LN-4)/2;" SELECTED!":POKE 752,0
XRZ 210 POKE 53248,0:POKE 53249,0:END
```

CHANGES AND ADDITIONS

```
25 REM REVISION 1.0
65 DIM SHOW$(74),GRAB$(74),INVERSE$(59),DN$(10),SCRL$(40),TAB$(82)
66 GOSUB 540:GOSUB 5500
140 MD=100:DIM DEF$(MD),PCD$(100),A$(130),FN$(25),TMP$(25),CLS$(N1)
270 REM
310 DIM DAT$(8640),W$(120),SP$(100),SP1$(N1),F$(17)
370 GOSUB 380:GOTO 2790
670 GOSUB 680:GOSUB 770:RETURN
949 IF N=C84 THEN DN=DN-N1:RETURN
2170 IF N=C84 AND OP<>61 AND OP<>C84 AND OP<>32 THEN OPH=OP
2190 IF N=70 THEN DN$="FORM":GOSUB 950:GOTO 2220
2265 IF N=89 AND OPH THEN OP=OPH:GOTO 2110
2315 IF N=126 THEN 2110
2460 GOTO 2110
2795 POKE ML,N2
3730 POSITION NO,22:PRINT SP$(N1,N2);"DECIMAL PLACES, N, $, T OR F?";
3760 IF N=36 OR N=C84 OR N=78 OR N=70 THEN 2170
```

Atari ST Stat Package Part I

by Wynn Rostek

2 + 2 Is Not Always 4, Or Why Your Computer Can't Add

Welcome to the start of a new column for *Computer Shopper*. I have been covering the ST for *Computer Shopper* a little over a year. In addition to the articles I write about the ST, I also run a small software company that publishes programs for the Atari ST.

Several times in the last year or so, our editor, Stan Veit, has asked why I have not released a statistics package for the ST. I always had the same answer, "There are not that many STs being used by serious computer users." I say sadly. The ST is a fine entry level machine, but almost everyone doing computing has an IBM or a clone.

In a way, it is a real pity because the ST has a 68000 CPU running at 8.0 Mhz, and the machine is capable of a very impressive performance, but the IBM and clones are still the preferred boxes for "serious" computing. This is mainly the result of the sheer volume of software available for these machines.

The problem is not just the ST, but many other machines. If you already own a computer but it doesn't have those three magic letters, you may find yourself feeling left out when the time comes that you need to get a job done.

The bottom line is that I said I would rather write some articles for the *Computer Shopper* than try to sell the package. That way I could cater to a much larger audience than if I tried to sell the programs.

The Editor's eyes lit up and now I find myself up to my armpits in books, digging out all the little tid-bits on number-crunching. There are pages and pages of notes with funny symbols scrawled on them all over the house.

Instead of limiting the work to a single computer, or even a couple of computers, I hope to give enough details about each program that you could easily write a program to do the same thing in your favorite language for your favorite computer.

The programs that appear here will not be skimpy, bare-bones routines, but full fledged, work horses. To make the programs even more useful, I have borrowed some ideas and beliefs from UNIX. The tools you will see here will get their input from a file, and leave the results in a file.

By using this interface, the programs can be strung together into "super-programs" that can be used to accomplish more jobs than I could ever envision. This also allows me to cover more ground in the space allocated for this column.

As an example, the first program I present will solve systems of linear equations. This same program acts as a back end for curve fitting and several programs that help design circuits, along with some statistics programs. When I cover curve fitting, I will not do the complete job in one program because the program to solve linear systems is already available to finish the curve fitting.

I am writing the first couple of programs in C because I am more comfortable with C than most other languages, and because most C compilers offer 64 bit floating point numbers, the importance of which will become clear later. I will not produce the typical "cryptic" C program. If you know Pascal, you will find the programs look almost like Pascal.

One thing that has bugged me from the first time I picked up some public domain source code is the rather poor shape most public domain programs are in. If you are going to release source code to the public domain, you should make it as easy as possible for someone to come along and modify the program.

Because I can't tell ahead of time which language or compiler you will be using, I will keep the source code that appears here very plain, avoiding the fancy tricks and features the language may offer. That way, even if you are not working with the same language, you should still be able to follow the code.

I plan to cover many topics, from statistics, number-crunching, and computer aided design to graphics, finance, and just plain fun. If there is an area of particular interest to you, why not drop me a line? You never know, your interest may prove to provide the catalyst for a column.

Before I jump into this mess feet first, there are a few topics I need to cover first. These are things that greatly influence the way you do computations on a digital computer.

The first topic I need to cover is the fundamental limitations of using a digital computer for computations. The limitations really arise because you are using a discrete representation for a continuous system.

Before any of this makes sense, I'm going to have to tell you how a floating point number is represented inside most computers. (BASIC and Pascal programmers know these as "Real" numbers, but they are no more real than integers...)

There are several ways to represent floating point numbers in a machine, but they are really only minor variations of each other.

To illustrate the format of floating point numbers, I'll use the "Fast Floating Point" format, also known as Motorola FFP format. In the FFP format, a floating point number is 32 bits long. The number is stored quite a bit like scientific or exponential numbers are written.

Before I go into the exact representation of the FFP format, let me tell you about scientific or exponential notation. In scientific notation, the number is written as the product of a number and a power of ten. If you use a calculator,

continued on page 242

Hacking The ST

by Wynn Rostek

In the last column I mentioned the GEMDOS called Foppen and Fread. This time I plan to explain these functions and show assembly language routines that use these calls.

tem software included with TOS. GEMDOS looks very much like MSDOS to the programmer. The only real differences are the fact that parameters are passed differently and the error codes are different.

Fopen is GEMDOS function 3d (hex) and is used to open a file. Fopen takes two parameters, the file name (a relative or absolute path) and the mode.

The file name needs to be a null terminated string, and the address is passed on the stack. The name can include any of the following: Drive specifier, (A:, B:, etc.) a path consisting of 0 or more sub-directories, (such as \TEXT\NOVEMBER\) and a file reference.

The file reference can be ambiguous, that is the file name may contain wildcard characters (* or ?) or it can be explicit. (FOO.TXT)

When an ambiguous file name is used, the file opened will be the first file that matches the ambiguous reference. Calling Fopen a second time with the same ambiguous name will result in the same file being opened. (You can't step through files with the Fopen command, there are two other commands you need to use to do this.)

The mode can be read-only, (0) write only, (1) or read/write (2) which allows random access. The function returns an integer in d0. If the returned value is positive, it is the file handle. A negative value indicates an error.

The Fread call is used to move data from a disk file into a buffer in memory. Fread requires 3 parameters: the file handle, the number of bytes you wish to read, (This is a long value, 32 bits) and the address of a buffer to hold the data.

GEMDOS, like MSDOS, uses file handles (integers) to identify a file, this makes file access much easier than the old method of dealing directly with file control blocks. (FCBs)

The results of the file read operation is returned in d0. If the read was successful, d0 contains the number of bytes actually read. If the file contains fewer bytes than you requested, an error is not generated, the routine simply reports the number of bytes it could read.

If an error occurs, the value returned in d0 is an error number. (All error numbers are negative.)

The ST only has a limited number of file handles reserved and these need to be guarded carefully. You might think that since we have so much memory we could stand to have a very large number of file handles for the system to use. You would be wrong.

The truth of the matter is that the file handle only serves to identify a structure that contains a lot of information about the file, along with a small buffer. This is the function of a file control block! We really have not eliminated the FCB, but the programmer doesn't have to worry about the details anymore, the system takes care of it for him.

Since the FCB takes up a fair amount of space, the system limits the number of them. Each open file must have its own FCB, so it is important to free up a file control block once you are finished with the file. The way to free up the file control block (and file handle) is to perform an Fclose (File close) call.

Closing a file is important for another reason besides freeing the handle. If you have opened a file for writing, the information written to disk is not permanent until you close the file. The information is on the disk, but there is no record in the file allocation table about the data being used.

Unless the file allocation table on the disk is updated, as far as the disk is concerned, the sectors holding your data are blank and free to be used by anyone that needs disk space.

Closing the file records information about the size of the file, and the sectors used to hold the file, on the disk. Until you close the file, the information is kept up to date in memory, but the disk is left alone. If the power goes down before the file allocation table is updated on disk, there is no record of your file.

The moral of the story is clear, always close a file as soon as you are finished with it.

The Fclose call (3e hex) requires a single parameter, the file handle. If the system is able to close the file, a 0 is returned. If an error occurs, an error number is returned.

To show these calls in action, I have provided a program that counts characters, words and lines in a file. This

continued on page 239

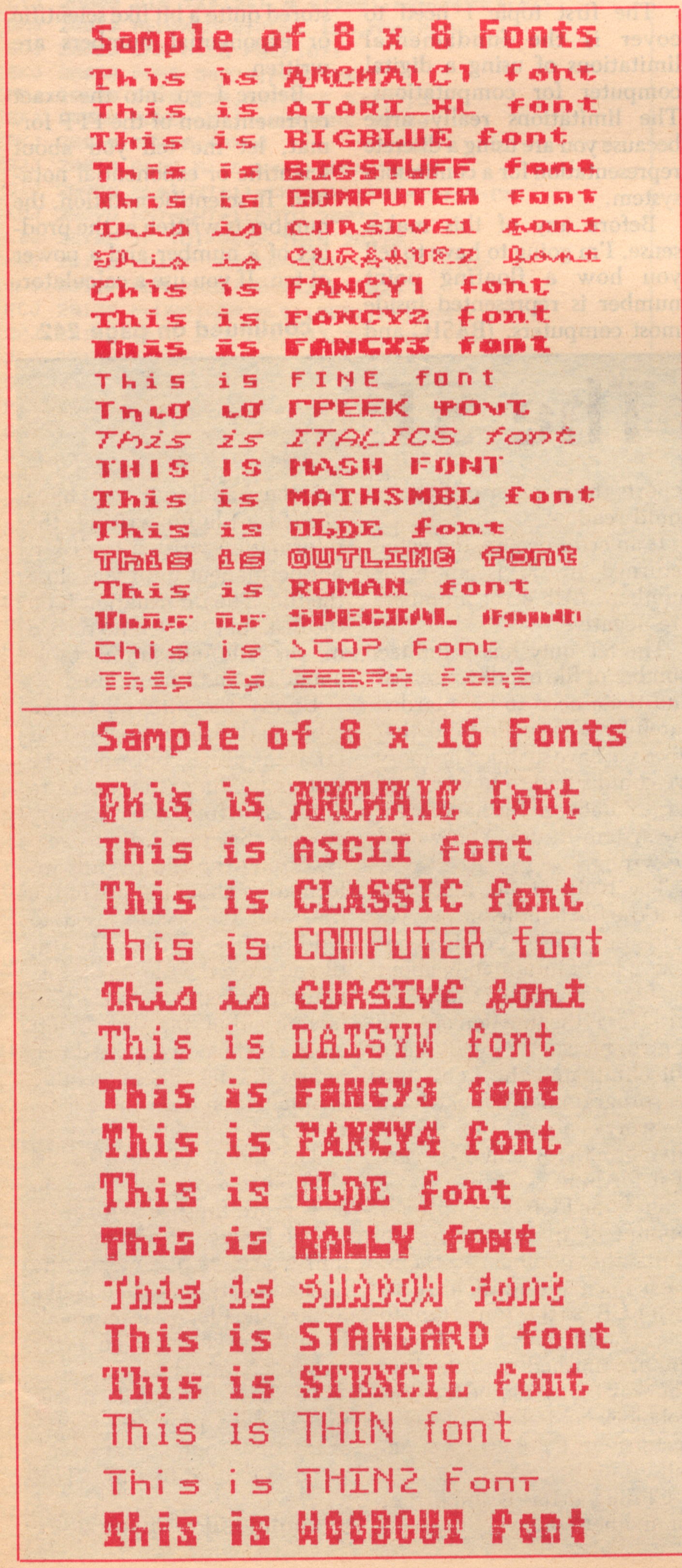
Megafont ST A Print Utility For The Atari ST

Reviewed David L. McLean

As a conclusion to my series of reviews on graphic editors and print utilities released by Xlent Software for the Atari ST, I have saved my favorite for last.

Megafont ST by Randy Dellinger is a file utility used for listing files in a variety of character fonts. It also allows the insertion of graphics with your text files.

Also on the unprotected disk, Megafont ST provides two GEM based font editors for those of us who want to create our own special character sets. The two character formats which Megafont ST supports are 8x8 and 8x16.


Sample of 8 x 8 Fonts

This is ARCHAIC1 font
This is ATARI_XL font
This is BIGBLUE font
This is BIGSTUFF font
This is COMPUTER font
This is CURSIVE1 font
This is CURSIVE2 font
This is FANCY1 font
This is FANCY2 font
This is FANCY3 font
This is FINE font
This is GREEK font
This is ITALICS font
THIS IS HASH FONT
This is MATHSMBL font
This is OLDE font
This is OUTLINE font
This is ROMAN font
This is SPECIAL font
This is STOP font
This is ZEBRA font

Sample of 8 x 16 Fonts

This is ARCHAIC font
This is ASCII font
This is CLASSIC font
This is COMPUTER font
This is CURSIVE font
This is DAISYW font
This is FANCY3 font
This is FANCY4 font
This is OLDE font
This is RALLY font
This is SHADOW font
This is STANDARD font
This is STENCIL font
This is THIN font
This is THIN2 Font
This is WOODCUT font

After making my backup copy, I was ready to get started. After booting the program a title screen appears and a simple returns gets rid of it. Next, a dialog box opens with several printer choices.

Like other Xlent products, Megafont ST supports a large array of printers. Again a simple return selected "Epson & Compatibles" which was my choice.

The GEM menu bar with it's drop down windows and a mouse is all you need to list your files. Note that I said list, not create. Megafont ST is not a text editor or word processor. I would compare it to a text formatter, but it's more concerned with printing a variety of character fonts than the document structure.

The menu bar has the following headers: Desk, Font Type, File Type, Print Mode, Options, Print Text, and Graphics. We'll go into each of the drop down menus and the way they function with the program.

The "Desk" header allows selection of Megafont ST title screen or any desk accessories that may be loaded. This is a departure in that some of Xlent's other products won't even run if any desk accessories are loaded.

If I was printing a document and decided to be a little different by using a fancy style of text, the "Font Type" drop down menu allows selection of either a font designed on a 8x8 or 8x16 matrix.

Different fonts can be selected by clicking on the font name to activate the file selector box. Megafont ST is supplied with 21 different 8x8 fonts, and 16 8x16 fonts. The 8x8 fonts have a filename extension of ".FN8" while the 8x16 have ".FNT."

The 8x16 matrix fonts are also DEGAS compatible so you can use any fonts you may have already created. Changing from the default font is easy within the Gem environment.

By clicking on the current font name a dialog box is opened allowing another font to be loaded. More on using multiple fonts on a single document a little later. To exit and return to the Gem desktop you need to only click on the QUIT option found here.

The file types and the way that Megafont ST approaches these files seemed interesting. The drop down menu supports five selections. Selecting one of the first three file types (AS IS, ASCII (AS IS), AND ASCII (STRIP)) will print the file as it was saved, but each option offers minor differences.

AS IS prints any and all special characters saved in your file except carriage returns. Special characters such as space and tap are printed just like any part of a word. Special symbols are used for these normally invisible characters. When using this option, your printouts are limited to only one font.

ASCII (AS IS), works about the same as (AS IS), but multiple fonts can be used.

ASCII (STRIP) limits the ASCII character set value to the range 0 to 127. The eight bit will striped (reset) if present.

I really didn't have much use for these modes, but maybe your needs will be different. Since the previous three modes printed all ASCII characters, including spaces and other special characters when printing a file, I used the last two options.

1ST Word, is an option that prints the normal text character set. Printing files using the extensive fonts sets provided made for very interesting looking documents. This mode also allows changing fonts as often as you like in any file.

The last of the file types supported, Wordstar, caught me off guard for a second. I thought I had most of the word processors for the Atari ST, but Wordstar was not one of them.

This one is included so you can print files that might have been created with "one of those other machines using MS-DOS" or maybe an old file laying around from a CP/M system.

Jumping right into the next area, the program allows you to select four different print sizes. They are, small, medium, large, and extra-large. With the small print size I was able to get about 15 characters per inch, medium gives around 7, large prints about 5, and extra-large yields 4 characters per inch.

Reformatting your document will probably be necessary if you use a print size other than small. A little experimenting is needed to get the document width set just right.

Once you've decided on the print size the program will allow you to set the page format option of your final output using the Options drop down menu. The typical page format options are supported such as left and right margins and page advancing after 55 lines of 8x8 or 35 lines of 8x16 print.

The program also allows you to set line spacing. The number of blank lines printed between lines of text can be set to a maximum of 8.

If this wasn't enough the program also supports micro spacing to adjust for those so called "Epson" compatible printers that aren't so compatible. You can also use boldface (double strike) printing to make the text print darker.

Megafont ST uses special ASCII characters embedded into a file for controlling special print functions within a document. These characters are called delimiters. Megafont ST supports two, a text delimiter and a graphics delimiter.

The text delimiter, when encountered in a file tells Megafont ST that a change in fonts is required.

The Text Delimiter used is the vertical bar (ASCII 124). The manual spends a fair amount of time explaining how to change font codes. There are a few restrictions, but none that I found that would create any major conflicts.

An example might help in this area.

To change to an 8x8 style font:
|0| or |0A:\pathname\fontname.fn8|

To change to an 8x16 style font: |1| or |1A:\pathname\fontname.fnt|

As in the above example, the delimiter "|" separates the control information from the text. Changing from an 8x8 to an 8x16 font is easily taken care of by just inserting a 0 for 8x8 or a 1 for 8x16 font between the vertical bars.

Megafont ST also allows mixing text and graphics in your document. A "Graphics Delimiter," is embedded in the file similar to the text delimiter. A tilde character (ASCII 126) is used to flag the program that a graphics file is to be printed next.

The proper usage would be:
∿XA:\pathname\file-name.ext∿
where X =
D for DEGAS.PI3 files
0 for RAW (32K) files
1 for RAW (32128
M for Mono Icons
C for Color Icons

There are margins which can also be set to properly center the graphics to be printed.

Megafont ST also provides a utility for making your own fonts. However, with the available selection provided, I doubt that I'll need to create any.

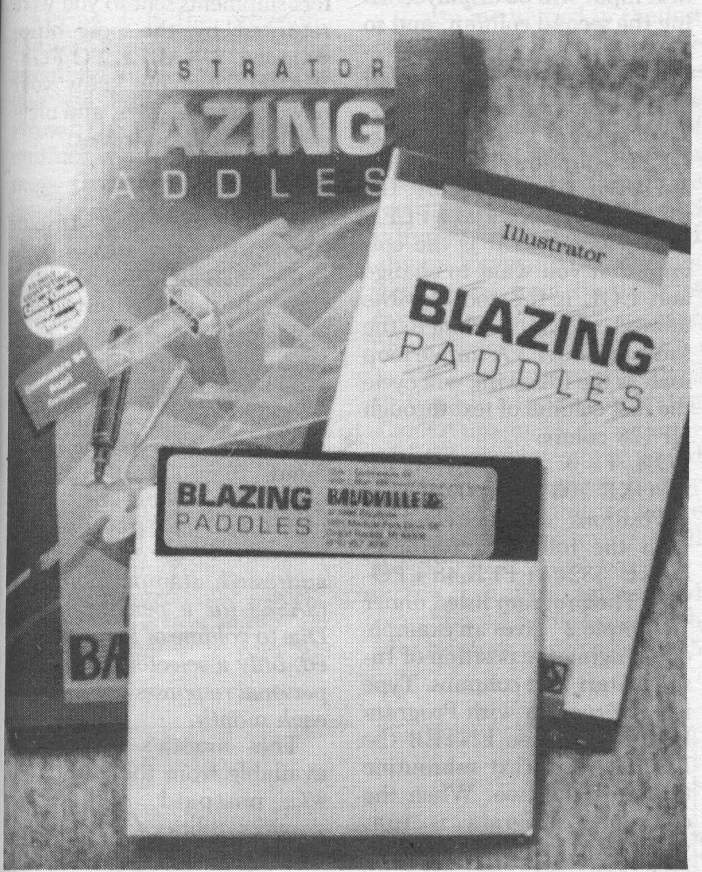
EDIT8X8.PRG appears to be a very versatile font editor and allows the creation of your own character set. The DEGAS font editor is available if you have the very popular drawing program for generating your own 8x16 fonts.

The manual I found to be very well written and with the examples provided on the program disk I was able to produce exciting documents in a very short period of time.

The program was written in OSS Personal Pascal and has evolved from the 8-bit machines to the MS-DOS world and now to the Atari. I found no, I mean no! bugs in the software and this is the first for any product that I have reviewed from Xlent Software. (Perhaps a first in the entire history of software.)

This printer utility is well written and appears to be solid. I think it would add nicely to your assortment of software for your ST. For $39.95, you really get a good value for your money. Its available through: Xlent Software, P.O. Box 5228, Springfield, Virginia 22150; (703) 644-8881. ●

Blazing Paddles



Reviewed by Jeff Brenner

Blazing Paddles is a full-featured drawing program that lets you create colorful, high-resolution pictures. Big deal, you say? True—we already have *MicroPainter*, *Micro-Illustrator* and a bunch of other programs that we can draw with. But *Blazing Paddles* merits particular attention because of its versatility, ease of use, and generous number of features. The program was originally designed for the Apple II and Commodore 64 and is now available for the 8-bit Atari.

Drawing Pictures

Commands are initiated through an icon-based menu. The icons and functions are reminiscent of *MacPaint* (or the ST's *NEOchrome*) and include the following commands: Clear, Window, Text, Shapes, Disk, Printer, Zoom, Spray, Fill, Color, Lines, Dots, Sketch, Box, Oval, Scroll, Mirror, and Help.

The actual drawing can be done with a joystick, touch tablet, game paddles or a light pen. All of these devices are supported by the program.

Cut And Paste

The Window command contains a cut and paste feature that enables you to move a part of the picture to another area of the screen, or stamp an image on various parts of the since you can restore the screen back to its previous condition if you don't like what a particular command has done to your picture.

Text Mode And Predefined Shapes

Text in up to three different sizes can be placed on the screen where you desire. Bold and italic character sets can be loaded from the program diskette and used on the screen, or you can load a custom character set.

The Shapes command is an interesting concept. A variety of predefined shapes (such as people, cars, animals, etc.) are contained within the program and can be placed on any part of the screen in a number of possible orientations (flipped 90 degrees left or right, upside down, mirrored, etc). For those of us lacking in drawing ability, these predefined shapes can really help to get things going.

Unfortunately, the program offers no provisions for defining your own shape tables, which would have been a natural extension of the Shape mode. A custom shape table screen. The cut and paste mode can also be used to cut out part of one picture and paste it into another. There is a limit to the amount of screen area that can be "cut" at one time (about ¼ screen), and while this wouldn't normally pose a problem, you can run into difficulties if you want to manipulate larger areas of the screen.

Special Features

With any of the drawing commands, one of seven brush strokes can be selected, including horizontal and vertical lines, thick and thin boxes and diagonal lines. One of three solid colors or the background color can be selected when drawing, or you can mix two colors together and draw with the mixture (although not all colors mix smoothly, so the individually colored pixels may remain discrete.)

In addition to the drawing command, *Blazing Paddles* offers a zoom mode, which enlarges a portion of the screen for detailed work; a scroll command, which lets you scroll your drawing about the screen so you can reposition it as desired; and a mirror command, which mirrors a portion of the screen that you box in.

The "Undo" command will be appreciated by the novice and experienced user alike. It allows you to undo the very last command that you entered, thereby giving much more freedom for experimentation, must instead be simulated, by "cutting" your own shapes from the screen and saving the cutout (called a window) to disk. The window can then be loaded in when drawing a future program, and your image could be stamped onto your new picture.

Disk Commands

Saving and loading picture files are, of course, supported by the program, as are a number of DOS commands (such as rename and format disk).

Printing Pictures

The printing mode supports Epson, Gemini, Panasonic, Okimate and compatible printers. Pictures are printed in color on the Okimate 20, and in shades of gray on the others.

Documentation

The instruction booklet is complete and well written, although it describes the Com-

continued on page 238

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Blazing Paddles

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modore version of the program. An additional sheet describes the differences that are encountered with the Atari version.

Conclusions

Overall, *Blazing Paddles* is well designed and packed with useful features. The price is somewhat steep, but otherwise I have very few reservations about recommending this program to anyone looking for high quality drawing software. The icon-based menu and the help screens make *Blazing Paddles* particularly well-suited for the novice Atari user, while the many advanced features, such as the cut and paste, color, shape and text commands, will be appreciated by those more experienced.

Requires: 8-Bit Atari Computer, Disk Drive, Joystick, touch tablet, lightpen or paddles. Author: Michael Darooge, Atari version by Joe Hellesen. Price: $39.95. Warranty: 90 days, free replacement. Manufacturer: Baudville, 1001 Medical Park Dr. S.E., Grand Rapids, MI 49506; (616) 957-3036.

Ratings for *Blazing Paddles*

* Poor, ** Fair, *** Good
**** Excellent

Program Design	****
Practicality	****
Documentation	***
Value for price	**½
Average	***½

●

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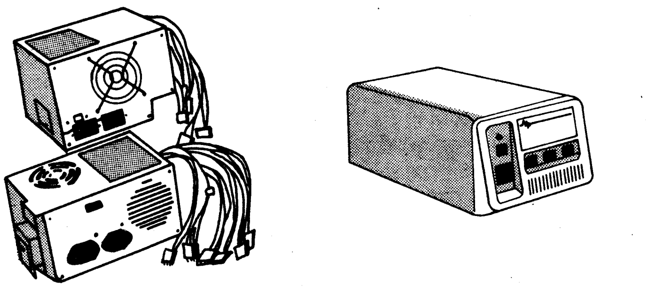

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Applying The Atari

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mand to a single value that can be stored in COL, use the following formula:

SETCOLOR 0,X,Y
is equivalent to
COL = X*16 + Y

Next, the position on the screen where you want to place the column is loaded into variable POS. This corresponds to the horizontal positioning used on the Graphics 0 screen. For example, to start the column at the leftmost side of the grahpics area, POS would be set to 0. For the rightmost side, POS would be set to 39. POS can be set in increments of one fourth for finer positioning (i.e. 15.25).

The actual message is stored in variable TX$, which is automatically dimensioned by the initialization subroutine. The message can be up to 24 characters in length.

To actually display the message on the screen using the column specified by PLR, the color specified by COL and the position specified by POS, use GOSUB 28230 and voila—Instant Atari Text!

The following short program is an example of how the Instant Atari Subroutine is used. Type in the following lines, ENTER the Instant Atari Text subroutine that you saved to cassette or disk, and then RUN the combined programs:

Type in a message when you see the question mark and press RETURN. The message will be displayed using the first column in Instant Atari Text. The next input will be displayed using the second column, and so forth.

Colors and positions can all be changed on the fly as well. To change a color of a particular column of text once it has been displayed, use the following: POKE 703 + PLR,-COL, where PLR is the column that you want to change and COL is the code for the desired color (according to the formula above.) A simple loop such as the following will cycle the first column of text through all 128 colors:

FOR I = 0 TO 255 STEP 2:POKE 703 + 1,I:NEXT I

Positions can be changed with the following formula: POKE 53247 + PLR,48 + POS*4. The program listed under "Example 2" gives an example of changing the position of Instant Atari Text columns. Type in the program with Program Perfect and then ENTER the Instant Atari Text subroutine to merge the two. When the combined program is run, you'll see a menu screen. Two text columns are used to display the "PRESS START TO BEGIN" and the "PRESS SELECT TO CHOOSE" messages. Line 180 serves to animate the message columns by moving them across the screen in opposite directions.

EXAMPLE 1

```
     XJJ 10 GOSUB 28000:POS = 18:COL = 3*16 + 8
XPJ 20 FOR PLR = 1 TO 4:INPUT TX$:GOSUB 28230
     :POS = POS + 1:COL = COL + 48:NEXT PLR
SPZ 30 STOP
```

Paging, Paging...

Confidential to readers D. Ackerson and D. Nadler: Letters/shipments sent to you were returned by the post office stamped "UNABLE TO FORWARD." Let me know your new addresses, guys, and mention your old addresses.

Next Month

We'll learn how Instant Atari Text works, answer more reader mail and, space permitting, build a living-cell, biologically interfaced 85-megabyte organic memory expansion unit with intelligent decision-making capabilities. This project is not for the timid.

Readers' questions, comments and contributions are welcome. Please enclose a self-addressed, stamped envelope (SASE) for a personal reply. Due to volume of letters received, only a selected number of personal responses can be given each month.

This month's diskette is available from the author for $7, postpaid. (The two graphics utilities will be included on the disk only upon request.) Please make your check payable to "Jeff Brenner" and specify your disk drive model.

"Program Perfect" is a utility used to check for typing errors while entering programs from this column. Readers can send $5 for a diskette or a SASE for a listing of this program.

Address all correspondence to: Jeff Brenner "Applying The Atari 3/87" c/o *Computer Shopper*, P.O. Box F, Titusville, FL 32781-9990. ●

Two New ST Books

Reviewed by Bruce Laubenheimer

Atari ST, Logo User's Guide
Abacus Software, Inc.
P.O. Box 7219
Grand Rapids, MI 49510
Suggested Retail: $19.95.

This is the seventh book in a series from Abacus. As with the others, this book was originally written is German and then translated to English. The original copyright owner and publisher in Germany's Data Becker.

Many people consider Logo to be a child's language. While it is true that Logo is used to teach computer literacy to elementary school students, the language does share some of the sophisticated word and list processing capabilities normally associated only with the artificial intelligence languages.

Logo like most versions of BASIC is an interpreted language. This means that the computer will translate each of the program's code statements into machine language as the program is executed. This conversion is performed on each statement every time it is encountered and there is a resulting speed penalty.

This version of Logo supplied with the earlier 520ST and 1040ST computer systems is Digital Research's particular dialect. This language supports an extensive number of commands allowing a Logo programmer built in capability without the requirement of coding everything from scratch.

The first chapter is entitled "Logo under GEM" and serves as a general or BASIC tutorial on the use of the GEM desktop. This serves as a good introduction to the GEM environment for a new user, and supplies information that is difficult at best to gain from the manuals supplied with the computer.

The next four chapters of this book is concerned with the generation of simple programs in Logo, starting with a discussion of how calculations and looping may be performed in the language. The section ends with a fairly comprehensive explanation of the use of the Logo text editor.

The book continues with sections on advanced Logo subjects such as graphics generation, recursion, and list processing. There are descriptions of each Logo's commands with examples of proper usage.

If you are considering using Logo on the ST, for whatever reason, the purchase of this book would be a valuable in-

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Hacking the ST

continued from page 105

program uses 16K buffers and special routines in place of the normal C file routines.

Listing 1 is the program. Listing 2 (pg 240) is the assembly language routines that use Fopen, Fread, and Fclose. The assembly language routines make file reading a snap from C or assembly language.
acter from the file in d0, and when the buffer is drained, it will automatically fill it. These routines perform the same job as some C routines, but they use a 16K buffer.

Please note the lack of error checking in most of the routines. You may want to add some if you develop a commercial product, but once a file has been opened, there are very few problems that are not a result of programmer error.

Many times you may want tighter control over your file I/O, and it is easy to modify these routines to suit your purpose. If you wish to interface these to C, you will need to declare the structure. Use WC.C as a guide.

I also mentioned in the last column that I had a hardware project ready. Actually the item in question has been in use for several months. Because of my work on communications programs for the ST, and the fact that the company owns 5 different kinds of computers, I always found myself unplugging cables from the back of my ST so I can hook up some other device.

After about 100 connections to the ST I started worrying about damaging the connector and the problems that would cause. The solution to my dilemma was simple, cable the ST to a switchbox and plug all the devices into the box.

You can buy commercial switchboxes, but the ones with four or more positions are $75 and up. I decided that I could throw one together in a couple of hours for under $30, so I started work.

The first thing I needed to do was to decide what kind of switch was needed. I'm lucky because I have two stores within 30 miles that carry government surplus electronics. I knew I could get a suitable switch for only 2 or 3 dollars, far below what it would cost new.

The pinout for the serial port on the ST is given in Table 2. As you can see, there are only 9 pins used. Since pin 1 (Protective ground) and pin 7 (Signal ground) are grounds, we are left with only 7 lines that need to be switched. Not all of the lines are used by any one device or program, but it is a good practice to switch all active lines in case they are needed in the future.

Armed with the knowledge of the number of active lines and the switch positions I wanted, I trekked off to Orlando to dig through boxes of old surplus switches. Since I wanted at least 5 serial lines coming out of the box, I needed to find a switch with at least 7 poles and at least 5 positions.

When dealing with switches, you will often run into a bit of shorthand that can be a little confusing at first. A multiposition switch may appear listed as: 5 pole, 6 throw, shorting.

Poles refer to the number of sets of contacts that the switch has. A 5 pole switch has 5 sets of contacts. To build the switch box, you need a 7 pole switch. If you get a switch with more poles (say 9) then you can switch the ground contacts or just leave some poles unused.

6 throw is just another way of saying that the switch has 6 positions. The one thing that you want to keep a careful eye out for is whether the switch is shorting or non-shorting.

A shorting switch will connect all contacts except for the active one together. This should not hurt a device that uses a serial interface (the outputs should be current limited) but I would just as soon avoid testing my equipment this way.

You should look for a non-shorting type of switch. If you dig into switches a little deeper, you will find that non-shorting switches come in two types, make before break and break before make.

continued on page 240

ERROR NUMBER	MEANING	MS DOS
-32	Bad function number	1
-33	File not found	2
-34	Path not found	3
-35	No more handles	4
-36	Access denied	5
-37	Invalid handle	6
-39	Out of memory	8
-40	Bad memory block address	9
-46	Bad drive specification	15
-49	No more files	18
-64	Range error	
-65	GEMDOS internal error	
-66	Bad file format	
-67	Memory block growth error	

Table 1.

GEMDOS error codes.

Pin Number	Signal name
1	Protective ground
2	Transmitted Data
3	Received Data
4	Request to Send
5	Clear to Send
7	Signal ground
8	Data Carrier Detect
20	Data Terminal Ready
22	Ring indicator

Table 2.
ST serial port pinout.

```
#include <stdio.h>
#include <osbind.h>


/* simple file variables */
struct c_fbf
     {
     char *nxt;
     long left;
     char bf[16384];
     int hand;
     int mt;
     }bufl,*wrk;

main(argc,argv)

int argc;
char *argv[];

{
int inword;
int stat;
long nc;
long nw;
long nl;
char c;
char getfc();

if (argc < 1)
     {
     printf("Sorry, you must supply a file name.\n");
     waitkey();
     exit(-1);
     }

/* we try to open the file here */
wrk = &bufl;
openf(wrk,argv[1]);

if (bufl.hand < 0)
     {
     printf("Unable to open the file for reading.\n");
     waitkey();
     exit(-1);
     }

/* now we are ready to start the counting */
inword = FALSE;
nc = 0L;
nl = 0L;
nw = 0L;

FOREVER
     {
     c = getfc(wrk);          /* get a character from buffer */
     stat = fend(wrk);        /* check for EOF               */
     if (stat) break;
     Bconout(2,c);            /* show character on screen  */
     ++nc;
     if (c == '\n') ++nl;
     if (issep(c)) inword = FALSE;
     else
          {
          if (!inword) ++nw;
          inword = TRUE;
          }
     }

/* close the file */
closef(wrk);

/* now we report */
printf("\n\n%ld lines, %ld words, %ld characters\n",nl,nw,nc);
waitkey();
}

int issep(c)

char c;

{
return((c == ' ') || (c == '\n') || (c == '\t') || (c == '\r'));
}
```

Listing 1. Word Count Program

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			w/Power	Case Only
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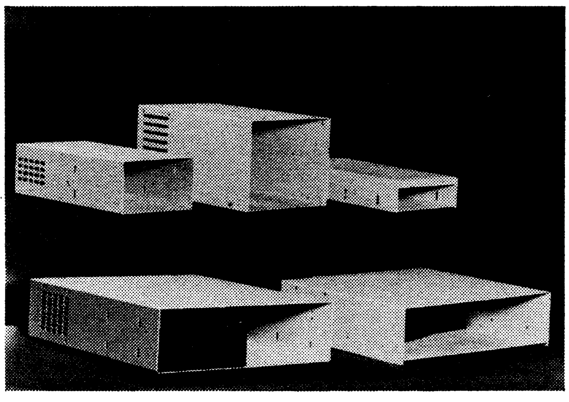

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Hacking the ST

continued from page 239

In a make before break switch, when you turn the knob from one position to the next, two sets of contacts (two modems) will be tied together briefly. In a break before make switch, the old set of contacts breaks (is no longer connected) before the new set of contacts makes (connects).

The best switch to use is the break before make kind because that way you are sure that you never connect two modems (or computers, etc.) together.

Don't lose any sleep over this fine point, the contact between two modems with a make before break switch only lasts a few hundredths of a second, not long enough to hurt anything. (I have never had a problem using a make before break switch.)

Figure 1 (pg 241) shows a schematic diagram of the switchbox. This is a project with a minimum amount of electronics. The bulk majority of the job is cutting holes for the DB25 connectors.

I was able to find a suitable switch for $2.25 and bought 6 DB25 connectors for $2.00 each. That left only the case.

I built the switchbox in a case from Energy Engineering. The box is 4 inches by 8 inches by 8 inches. The case is only $7.04. They offer a complete line of cases for small projects.

Cases are always the sore spot in electronic projects for me, and I suspect for most other people also. You may want to contact Energy Engineering for their free brochure. They have 200 sizes of boxes in stock and can make up custom sizes for very little more than the standard boxes.

You can write them at:

Energy Engineering
RT. 4 Box 330
Fayetteville, ARK 72701

You can call them at (501) 521-4707 for further details.

With the switch, connectors, and case, my 5 way switchbox ended up costing $21.29 and three hours labor. (Not counting the solder and wire I had laying around.) I have seen the connectors on sale at times for $1 or less so you can build a switchbox for about $15 if you really shop around.

A quick rundown of the function of the different pins of the serial port seems to be in order. Pin 1, protective ground is also known as frame ground.

continued on page 241

Listing 2. Assembly language routines

```
*
* started work on some simple file routines, using 16K bufffers
*


*
* this routine shuts the buffer. (closes the file) status is returned
* in D0.  This routine must be passed the address of the file buffer
* structure on the stack
*

_closef:    move.l      4(sp),A0            * get structure address
            move.w      16392(A0),-(sp)     * push file handle
            move.w      #$3e,-(sp)          * function = Fclose
            trap        #1
            addq.l      #4,sp
            rts

*
* this routine fills a buffer from disk.  It expects to be called by
* _getfc.  if you call this routine from some other routine, you must
* place the file buffer structure address in register A3.  don't call
* this routine unless the buffer is empty
*

_st003:     move.l      a3,a4
            add.l       #8,a4               * compute buffer address
            move.l      a4,-(sp)            * push buffer address
            move.l      #$4000,-(sp)        * push size
            move.w      16392(a3),-(sp)     * push handle
            move.w      #$3f,-(sp)          * function = Fread
            trap        #1
            add.l       #12,sp
            move.l      d0,4(a3)            * we read this many
            tst.l       d0                  * check it
            beq         tag2                * may have 0 read (EOF)
            bpl         tag3                * no error
* if we show up here, we couldn't read any
tag2:       clr.l       4(a3)               * no characters left
            move.w      #1,16394(a3)        * set EOF flag
            move.b      #$1a,8(a3)          * store CP/M EOF
tag3:       move.l      a4,(a3)             * save new extraction pointer
            rts

*
* this routine gets a character from a buffer.  it is passed
* the structure address on the stack. character returned in d0
*

_getfc:     move.l      4(sp),a3            * get structure address
            move.l      4(a3),d3            * get number left
            tst.l       d3
            bne         tag4                * no need to fill
            jsr         _st003              * fill buffer
tag4:       move.l      (a3),a0             * get extraction pointer
            move.b      (a0),d0             * get the character
            addq.l      #1,(a3)             * update pointer
            subi.l      #1,4(a3)            * update char count
            rts

*
* this routine is used to check the EOF flag, it is returned
* in d0.w.  structure address passed on the stack
*

_fend:      move.l      4(sp),a3            * get structure address
            move.w      16394(a3),d0        * get EOF flag
            rts

*
* this routine opens a file for reading. pass the structure
* address on the stack, and a pointer to the file name.
* the results are returned in d0
*

_openf:     move.l      4(sp),a3            * get structure address
            move.l      8(sp),a0            * get file name pointer
            move.w      #0,-(sp)            * read only
            move.l      a0,-(sp)            * push file name
            move.w      #$3d,-(sp)          * function = Fopen
            trap        #1
            addq.l      #8,sp
            move.w      d0,16392(a3)        * save handle
            move.l      #0,4(a3)            * no characters in buffer
            move.l      a3,a0
            add.l       #8,a0               * compute buffer address
            move.l      a0,(a3)             * reset pointer
            move.w      #0,16394(a3)        * reset EOF
            rts

*
* this routine sends a character (passed on the stack) to the screen
*

_st007:     clr.w       d0                  * zero high byte
            move.b      5(sp),d0            * get character
            move.w      d0,-(sp)            * push character
            move.w      #2,-(sp)            * console
            move.w      #3,-(sp)            * function = Bconout
            trap        #13
            addq.l      #6,sp
            rts

*
* this routine sends a string to the screen
* the address is passed on the stack
*
_st008:     clr.w       d0                  * zero high byte
            move.l      4(sp),a3            * get string address
tag1:       move.b      (a3),d0             * get character
            tst.b       d0                  * check for end
            beq         sout                * if done...
            move.w      d0,-(sp)            * push character
            move.w      #2,-(sp)            * console
            move.w      #3,-(sp)            * function = Bconout
            trap        #13
            addq.l      #6,sp
            addq.l      #1,a3               * point to next byte
            bra         tag1                * next character
sout:       rts

*
* very much like st008, buts adds a <cr>,<lf> pair
* to the end of the string
* the address is passed on the stack
*

_st009:     move.l      4(sp),a3            * get string address
            move.l      a3,-(sp)            * push string address
            jsr         _st008              * send string
            move.l      #newln,-(sp)        * push ending
            jsr         _st008              * send string
            add.l       #8,sp
            rts

*
* this is a replacement for waitkey(), it does
* the same job, but is assembly not C
*

_waitkey:   jsr         _drain              * clean out buffer
            move.l      #prompt,-(sp)       * push message
            jsr         _st008              * output message
* now wait for a character
            move.w      #2,-(sp)            * device = console
            move.w      #2,-(sp)            * function = Bconin
            trap        #13
            addq.l      #4,sp
* send a newline sequence
            move.l      #nulln,-(sp)        * push message
            jsr         _st009              * send string
            add.l       #8,sp
            rts

*
* this routine returns after 1 millisecond
*
killms:     move.w      #274,d1                 * number of loops
killup:     tst.w       d1                      * check for completion
            beq         killret                 * if done...
            subq.w      #1,d1                   * one less loop
            bra         killup                  * and once more
killret:    rts

*
* this routine returns after x milliseconds
*
_delay:     move.w      4(sp),d0                * number of milliseconds
delup:      tst.w       d0                      * check for completion
            beq         delret                  * if done...
            jsr         killms                  * wait a bit
            subq.w      #1,d0                   * one less loop
            bra         delup                   * and once more
delret:     rts

*
* this function empties the keyboard buffer
*
_drain:     move.w      #1,-(sp)                * device number (keyboard)
            move.w      #14,-(sp)               * i/o record call
            trap        #14                     * do xbios
            addq.l      #4,sp                   * clean up stack
            move.l      d0,a0                   * get address
            move.w      6(a0),8(a0)             * tail = head
            rts

*
* here we have some data
*

            .data
newln:      dc.b        13
            dc.b        10
nulln:      dc.b        0

prompt:     dc.b        'Hit any key to continue '
            dc.b        0
```

Hacking The ST

continued from page 240

The fact that there are two grounds may seem puzzling, but there is (or rather was) a good reason for it.

In systems with a very high gain (such as telemetry receivers) you can easily couple stray signals into equipment. In military gear, the racks containing equipment are insulated from the ground by rubber strips.

Each piece of equipment has a ground lead that leads to a single block of metal. By running all the frame grounds to a single point, radiation from the equipment is minimized and the equipment is less prone to picking up stray signals.

The RS-232C interface provides a pin that is supposed to provide a similar function. The signal ground (pin 7) is really a return path for the signals between the two pieces of equipment, and in some systems this may be isolated from the protective ground by several megohms. (There may be no connection between signal ground and protective ground.)

In home systems where there is less concern about interference and RF radiation than in a military system, you will find that often the protective ground and the signal ground are one and the same. This is true for pins 1 and 7 on the ST. (It probably wouldn't help much anyway, most home gear is in a plastic case, not a metal one.)

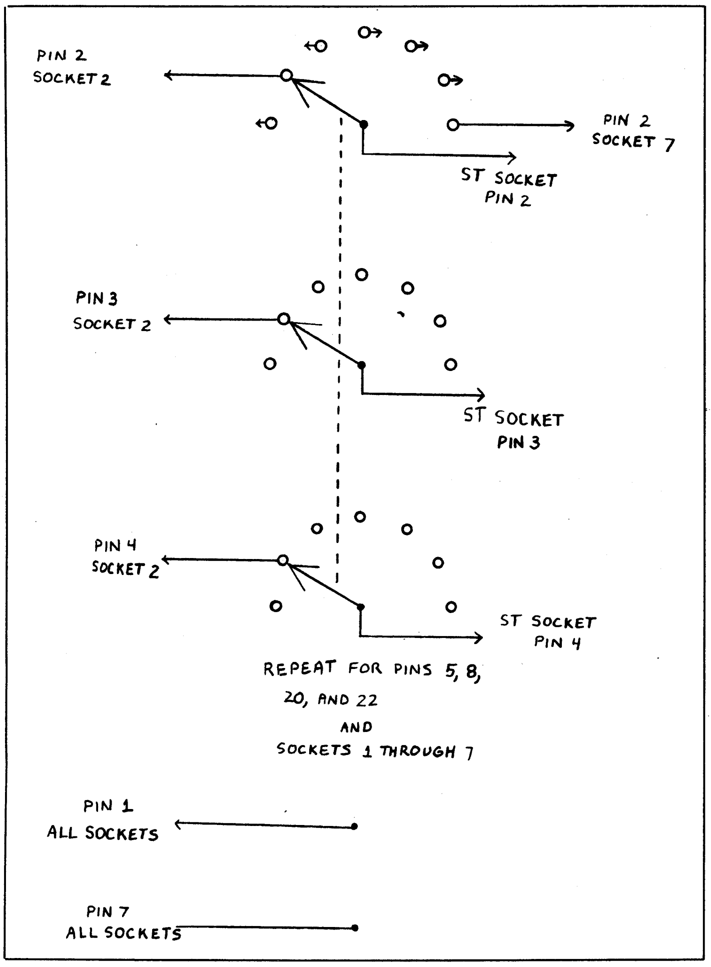

Figure 1. Switchbox Schematic

Pin 2 is transmitted data, this is the serial data coming from the ST and going to the modem. Pin 3, received data is for data coming from the modem to the ST.

Pin 4, request to send is a signal from the modem to the ST that tells the ST that the modem is ready to receive data. In almost all cases, the ST will ignore this signal.

Pin 5, clear to send, is a signal from the ST to the modem that tells the modem that the ST is ready to receive data. Most modems ignore this signal. For the most part, request to send and clear to send are used only to indicate that the equipment is powered on.

Pin 7, signal ground, as already mentioned is a return path for the transmitted and received data. On the ST this is the same as protective ground.

Pin 8, data carrier detect is a signal from the modem to the ST that is used to indicate that a carrier is present. (Another modem has established connection to your modem.) Most modems will default to forcing this signal high (active) when power is on, but it can be used as an actual carrier detect signal by throwing a switch on the modem.

Pin 20, data terminal ready is a signal from the ST to the modem that was used to indicate that the computer was ready to send data. These days, the signal is used to force a modem to hang up the phone. Most modems will ignore the DTR signal, by throwing a switch on the modem, you can cause it to respond to the DTR line.

Pin 22 is called ring indicator, this is not one of the original RS-232C signal names. Most smart modems will force this line high when the phone rings. (Even if there is no phone connected to the circuit, only a modem, there is still a ring signal sent to the modem when a call comes in.)

Since I will be doing more examples in assembly language and since 68000 assembly language is so powerful, I'll spend some time in the next column going over a programmer's view of the 68000. Til then, keep'em flying! ●

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Atari ST Package

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you might enter a number as 2.37E6. This is a shorthand way of entering 2370000. The first part of the number, the 2.37, is called the mantissa. The second part of the number, the 6, is called the exponent.

When you enter 2.37E6 the number is really 2.37 * 10 6 or 2.37 times 10 to the 6th power, or 2.37 times 1000000. The important thing to note is that we can store a number like 2370000 in only 4 digits, 2.37 is the mantissa and 4 is the exponent.

The advantage of scientific or exponential notation is that it allows us to store very large and very small numbers in a small amount of space. Just imagine how big 45.67E78 would be if you wrote it all out!

The FFP format allows us the same advantage, in a small number of bits, we can store very large or very small numbers, but what you gain in range, you lose in precision. Let me illustrate with a simple example.

Let's assume you have a system that uses 3 digits for the mantissa and 2 digits for the exponent. The largest number you can represent is 999E99, which is really a fairly big number, even for the federal government which is used to working with trillions.

The problem shows up when you talk about two numbers that are close together. Try to show your bank balance after a small deposit. Before I put my paycheck in the bank, I have $1,953.76. My paycheck is fairly small, (I work cheap) $1.75. After I deposit the check, I should have $1,955.51.

Let's see what happens when I let the computer do the deposit for me. Since it is using 3 and 2 digits, the initial balance would have to be represented as 1.95E3. This is only $1,950! I'm positive that I have been cheated! When I deposit my check, the new balance is 1.96E3 or $1,960. Now I'm much happier, but the bank is sure to be as mad as a wet hen.

The problem is that the computer has no way to represent any number between 1,950 and 1,960. Of course you can improve the situation by using a computer that has more digits (64 bit floating point numbers vs 32 bit) BUT ALL THIS DOES IS POSTPONE THE TIME YOU GET INTO TROUBLE, IT WILL NOT SOLVE THE PROBLEM!

The fact that you are using a digital computer ensures that your computations will have errors. To see why this is always the case, no matter how many bits your floating point numbers are, consider the following:

How many numbers are there between 1.0 and 2.0? A thousand? A million? More? If you pick any two numbers between 1.0 and 2.0, I can always find an infinite number of numbers between them. If you select 1.00000 and 1.00001, then 1.0000001, 1.00000001, 1.000000001 are all between 1.00000 and 1.00001.

Seeing how easy I find numbers between these two you might pick 1.00000000001 and 1.000000000001, but the problem is the same, I just pick 1.0000000000101, 1.00000000001001, etc.

No matter which two real numbers you pick, there will always be an infinite number of additional numbers between them, but the computer can't play this little game BECAUSE IT ALWAYS USES A FINITE NUMBER OF DIGITS.

How many numbers does your computer have between 1.0 and 2.0? With a 3 digit mantissa, we have 1.01, 1.02, ..., 1.98, 1.99 or 99 numbers between 1.0 and 2.0.

What are your chances that your computer can represent any given number between 1.0 and 2.0 exactly? There are 99 computer numbers, and an infinite number of real numbers so you have a 0% chance that your computer can represent any given number! (99 divided by infinity is close enough to 0.0000...that it makes no difference to quibble over it, unless you want to talk about the beauty of mathematics, or argue the fine points of theory.)

The reason that this glaring short coming has never slapped you in the face before is that the numbers that we feed into a computer have to come from somewhere, and they are usually measurements. Even our best thermometers can't tell the difference between 67.800000000001 and 67.800000000002 degrees, so we rarely encounter numbers that have any great precision.

As long as the precision of the computer is greater than the precision of the numbers you feed into it, you don't run into this problem. This is not to say that all your problems are eliminated, far from it. So far we have only discussed roundoff error, that error introduced by using a finite number of digits to represent numbers.

There are other kinds of errors that can occur in computer arithmetic. Since the computer is very good at repeating sequences of instructions, you will see many numerical techniques that "make a guess" at the answer and then use the results to make a new guess. This iterative (repetitive) approach holds it's own troubles.

Every time you make a calculation with a digital computer, you introduce slight errors into the numbers being calculated. In an iterative solution, these errors multiply rapidly and soon the error is larger than the answer.

To show how this happens (beyond round off error which we have already discussed) it is easiest to show a floating point addition, which brings me back to the FFP format I mentioned before. (It sure took long enough to get from there to here.)

In FFP format, the high 24 bits are the mantissa. The most significant bit has a value of ½, the next bit has a value of ¼, the next 1/8 and so on. With this set up the mantissa is always a number between 0.0 and 1.0. After the mantissa (or fractional part) comes the sign bit. This bit tells us if the number is positive or negative.

0.875 has the same mantissa as – 0.875, namely: 111000000000000000000000. The difference between the two numbers is the sign bit. The sign bit is set (a "1") if the number is negative, and is reset (a "0") if the number is positive.

The 7 least significant bits are used as the exponent. The exponent has no sign bit, it is itself a signed number, stored in two's complement form. In two's complement form, you make the negatives by inverting each bit in the number and adding 1 to it. As a practical example, 1 would be written 0000001, but – 1 is: 1111110 + 1 = 1111111.

Now I'm sure you are convinced that somebody really has it in for you because they are using two different ways of representing numbers here, but there are good reasons to do so. By representing numbers in two's complement form, the same circuits can be used for addition and for subtraction. (Subtraction is really only adding the negative of a number anyway.)

Then why not use two's complement for the mantissa? Because the exponent is only added, the mantissas are multiplied. The multiplication is done with software, not hardware. (Even math coprocessors, which are hardware, run little programs to multiply numbers.)

Remember, to multiply scientific notation numbers you multiply the mantissas together and add the exponents. This is the way logarithms work, and in fact it is the reason logarithms were invented. It is easier to add by hand than to multiply by hand. (Don't you wish you had paid attention when all this was discussed in class?)

In a normal floating point multiplication, the mantissas are multiplied, while the exponents are added. We use a sign bit with the mantissa and two's complement for the exponent.

As an aside, if you were playing with microcomputers in the very early days, you may have laughed when the computer gave an answer of – 0.0, but this is very understandable when you know how a floating point number is stored. The mantissa is printed out, and if the sign bit is set, a " – " was added to the front of the number, hence the – 0.0. Today, you check to see if the mantissa is 0 before you add the " – ", but it is still there inside the machine.

With a separate sign bit, there really are two 0's, they differ only in the sign bit. To

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New ST Books

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vestment. If you are already an accomplished programmer, the book does tend to drag at times. Apparently, this is due to the intended audience which consists of first time users. If you do not consider yourself in this category, there is sufficient subject matter and programming examples to justify the purchase of this reference book.

This book is the definitive source for the use of Logo on the Atari ST. It spans 374 pages and is fully indexed. At least Abacus has learned to include an index where others have not. Undoubtedly, the *Logo User's Guide* covers the language in more depth than the skimpy spiral bound manual supplied with my 1040ST computer.

In closing, the *Logo User's Guide* is a worth while addition to your reference library. The book contains many examples and demonstration programs in the Logo language. If you are not so inclined as to spend the time manually entering each of the programs, Abacus does sell a disk that includes all of the book's example programs.

Atari ST, *ST BASIC to C*, Abacus Software, Inc., P.O. Box 7219, Grand Rapids, MI 49510; Suggested retail $19.95.

This is the eleventh book in a series from Abacus. As with the others, this book was originally written in German and then translated to English. The original copyright owner and publisher is Germany's Data Becker.

This is an introduction to programming in a high level compiled language. I know that some of you are thinking, why not use one of the BASIC compilers that is currently available for the ST. BASIC compilers generally offer only a subset of the language, or pay a penalty in either the size of the compiled code or the execution speed of the finished program. A compiled BASIC pro-

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Atari ST Package

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the computer, there is a + 0.0 and a − 0.0, even if the machine's philosophy proves to be unsettling to humans. In two's complement, there is only a single 0.

Now we are finally ready to add two floating point numbers, and see why the answer is not always what you expect.

Before we add two numbers that are in FFP or scientific format, we have to account for the fact that the two exponents may not be the same. It is not considered kosher to add the mantissa's of 2.34E3 and 4.59E7 and claim the result is 6.93E3!

The mistake is obvious when the numbers are written out completely: 2340 + 45900000 = 6930.

To do the addition so that you get the accepted answer, you have to shift the values around so that they "line up."

$$\begin{array}{lr} & 2340 \\ + & 45900000 \end{array}$$

By shifting the values to bring them into alignment, then adding them we come up with the answer 45902340. When you put this back into our exponential notation, you see what has happened.

The final answer ends up 4.59E6.

Wait a minute, that is what we had before we added 2340 to it! If you were adding 2340 to a number inside a loop that your computer was running, you would expect the number to keep getting bigger, but as you can see in this case, the number doesn't change a bit!

What we have run into is another limitation of computer arithmetic. Before the mantissa's of two numbers can be added, they have to be shifted so that they "line up." When you start shifting, some data gets shifted right out of the addition. If the exponents are very far apart, almost all (or even all as we saw above) of the data is lost before the addition takes place.

In the FFP format, the exponent is 7 bits, so it can have values that range from − 64 to + 63. If the exponents differ by 3, three bits of the smaller number are lost. (In our simple example, the exponents differed by 4, and we lost 4 digits of our 3 digit mantissa.)

The net result of all of this is that floating point addition is less and less accurate as the exponents grow farther apart.

There is another hazard out there waiting for us, the dreaded overflow, and the even stranger underflow! Most people know that overflow occurs when the result of a calculation is too large for the computer to represent. Underflow happens when the results of a calculation are too small for the computer to represent.

If we are using the FFP format and we multiply 1.0E60 times 1.0E60, the result 1.0E120 cannot be represented by the machine, so it cries foul and announces an overflow.

With the same format, if we multiplied 1.0E-50 times 1.0E-50, (a decimal point, followed by 50 0's and then a 1) the result 1.0E-100 cannot be represented in the machine either. This creates an underflow condition.

Another brief bit of history, underflows are not as fashionable as they once were so we no longer announce them to the operator, we just set the result to the smallest number we can represent and get on with things.

The trend is starting to show up on the overflow side also, some compilers today will not announce an overflow, they just set the result to the largest number that can represent and press on. I expect that in a few more years no one will have the foggiest idea what an overflow is.

While I am not all that old biologically, this constant reminiscing about the good old days is a sure sign that I'm turning into an old fart. At least I don't go on and on about banks and banks of vacuum tubes or racks and racks of relays. Count your blessings.

Back to the issue at hand, there are several ways for you to get into trouble doing arithmetic on a computer. The computer only has so many digits (or bits) of precision. With a limited number of bits of precision, your computer can't always represent the number you give it. When this happens (which is very often) the computer uses some number close to what you gave it.

I'm sure everyone has entered 23.4 in a program only to have it echo 23.3999906 back to the screen. With a 32 bit floating point format, you have about 5 or 6 (maybe 7 if the wind is blowing the right direction) digits of precision, the extra digits are usually trash.

If you add numbers that are very different in size (the exponents are far apart) you will lose a lot of accuracy. Unlike adding numbers that are far apart, multiplying numbers far apart is fine, it hardly ever causes a problem. If you decide to multiply two numbers that are close together, you could run into trouble. If both numbers are very large, you get overflow, while two very small numbers generate underflow. In both cases you do not end up with the correct answer, and your computers idea of the answer can be off by a lot.

By now I have probably convinced you to do all your calculations long hand, or even to sell the computer and buy an abacus, but it isn't really all that bad. There are a few simple rules that keep us out of trouble almost all the time.

Rule 1: Never check to see if a floating point number is equal to 0.0. Unless you just said x = 0.0, it won't be. Always check to see if the number is very small (close to 0.0) instead. A good substitute is to use something like: If (abs(x) < 0.0001) then...

Rule 2: Try and avoid adding numbers that are very far apart. (Large differences in the exponents.) If forced to do this, remember that the results are bound to be off, perhaps badly. Especially avoid adding very small numbers to a large number inside a loop if the result controls the loop in any way. A lot of endless loops are caused by this, and it can be very puzzling to you when it happens. (When you review the code, you find that there is no reason for the machine to hang in the loop, and you assume it's broken.)

Rule 3: If you multiply very large or very small numbers, you can run into overflow or underflow. Sometimes this can be avoided by changing the units of the variable. As an example, it may be cute to figure solar distances in inches or centimeters, but your answer will be better if you start off with miles or kilometers.

Rule 4: Try to get the result with the minimum number of calculations. If you have two numbers that are within 10% and you add them, the result is only good to within 20%. Add two of these numbers and your result is only within 40%. Errors grow with each computation, and this kind of error is called propagation error. It can kill you quickly.

Rule 5: All other things being equal, the more bits in your floating point numbers the better. 32 is standard, 64 can be found on most systems if you shop around for a good compiler. C and FORTRAN usually offer 32 and 64 bit floating point numbers, and so in general are better for number crunching than BASIC or Pascal, which typically offer only 32.

Next month, I'll start in with some actual code. Since I have not invested a lot of work in a bunch of programs at this time, now is a good time to submit questions and requests. After I have written a lot of programs, I may be more reluctant to throw them away to work on your problem. ●

New ST Books
continued from page 244

gram will generally run much faster than the corresponding interpreted version, but there are some problems to consider.

Some BASIC compilers generate straight line code, where each call to a subroutine is coded separately and in line with resulting penalty in size of the compiled code. Other BASIC compilers only allow a sparse subset of the language, leaving out transcendental or trigonometric functions and floating point numerical operations.

Most people will agree that program compilation is the most efficient way to generate a program where execution speed is the primary concern. But, after that short discussion I hope that you can see that BASIC does not lend itself very well to that purpose. This leads us to the next natural step, which is the use of a language designed to create tight fast compiled code.

C is a language that was written by AT&T's Bell labs for the development of their UNIX operating system in the early 70s. It is considered by many to be essentially a high level portable assembler type language.

The previous statement may seem contradictory but I will try to explain. The C language allows a programmer the latitude of controlling the machine on the lowest levels. The ability to manipulate data in much the same way as it is with assembly language, allowing bit wise Boolean operations and register shifts of the data. In fact some C compilers allow assembly code to be included within the C source code.

The portability observation is due to mostly because C is a high level language. If there is a C compiler available for a particular machine and it implements the standard library routines the code will port with very little work. However, if the source code contains machine specific routines, inline assembly or there are differences in machine architecture additional re-coding may be required.

ST BASIC to C is primarily geared to those people who purchased the Alcyon C package through either Atari's ST software developmental program, or from Digital Research, Inc. The examples are referenced specifically to Alcyon C, but people using the other dialects of this language will still find this book a suitable guide.

The intended audience of this book is for a person who already has a fair grasp of the BASIC programming language and wants to learn how to program in the C language. If you have studied or are accomplished in the use of other high level languages such as Pascal, this book will probably be of minimal value.

For those people who are considered as part of the intended audience, this book starts on the premise that the elementary structures of C can be learned in one day. After reading the book, and observing the way in which the material is presented, I tend to agree. I wish this book had been available at the time when I started to learn C.

Each of the sections is presented with a fragment of C source code and the corresponding BASIC programming instructions. The C language commands are discussed in detail and any differences between C and BASIC are fully explained. The book does an excellent job in de-mystifying the normally used features of C that are foreign to a BASIC programmer. Those features being the assignment and usage of data types and pointers.

I have been programming in C for about 2 years, and to be honest this book was a little boring at times. However, in its favor I could not find any errors. As an interesting aside, I thought I had found an error in Chapter 9, which discusses common mistakes made by BASIC programmers when first introduced to C. In consulting a standard reference for the C language, I found that the error was mine.

Chapter 12 is dedicated to a general overview of the language using each one of the commands as well as the correct invocation syntax. The priority level for each of the operators is included as well. My only complaint with this chapter is that the layout could be grouped more logically for the neophyte. For example, grouping switch and its associated commands, or grouping all of the commands associated with program looping.

The book concludes with an appendix that lists additional reference material on the C language. If you are interested in learning C, here are my favorites. *The C programming Language*, by Kernighan & Ritchie, Prentice Hall, 1978. *Programming in C*, by Kochan, Hayden, 1983. *C Programming Guide* 2nd edition, by Purdum, Que, 1985.

ST BASIC to C spans 231 pages and is fully indexed. Some of the earlier Abacus reference books lacked this feature, but obviously that problem has now been corrected. For those people who are apprehensive about entering each of the program examples onto disk, Abacus does sell a disk that contains all of the book's source code and example programs.

The bottom line is, if you know BASIC and want to invest the time to learn C, *ST BASIC to C* is a worth while addition to your reference library. While it may not be a definitive source on all of the subtle nuances that you may find in the C language, it will lessen the time involved in learning the language and ease your transition from BASIC to C. ●

Apple IIgs Hints
continued from page 107

only has a small mono speaker installed. Hooking up stereo speakers to the headphone jack on the IIgs helps, but not much. Your speakers will sound better, but the headphone jack is only attached to the mono output. You need to add the Supersonic board from MIDIdeas (415/573-0580 retail $49.95). It multiplexes the IIgs' output directly from the Ensoniq sound chip, and amplifies it. You have the choice of low level, high level, and headphone jacks.

Q: How can I use the Supersonic board in the IIgs without taking up a slot?

A: Plug it in. Seriously, many boards which only need a slot for power or video signals will work without "taking over" a slot. Just plug in the Soundchaser into any empty slot, and forget it. You won't lose any of the internal IIgs interfaces. For example: If you want to use an Apple Cat 212 modem in the IIgs, plug the Apple Cat main board into slot 2, and the 212 board into any other empty slot. Tell the control panel that you are using your card (the Apple Cat) in slot 2, but ignore the 212 board. You have to tell the control panel about the Apple Cat's main board since it uses the IIgs' data and address lines, but the 212 expansion board only uses the Apple's bus for power. Other cards which don't need data or address space will also work the same way.

Q: I'm using a disk speed program on my IIgs. It says that my drives are running at 395 RPM! even though I'm certain that the drive is operating at 300RPM, the correct speed. I tried to set the Control panel's speed setting to slow, but that didn't make any difference. What's wrong?

A: It turns out the IIgs' timing is different from earlier Apples, and certain programs will not work, or will give weird results. Obviously your program is one of them. I tried four different disk speed programs on my IIgs. Three of them worked properly, and one of them reproduced your "feature." So it goes when you buy a new computer.

Q: What's the best way to make a single drive copy?

A: Set up your RAMdisk as the same size as your floppy (800K for a 3.5 drive, 143K for a 5¼" drive). Use your drive copy program to copy your diskette into the RAMdrive, put a blank diskette into the drive, and copy the disk back to the floppy. This two step process saves a lot of disk swaps, and will work with any standard copyable diskette as long as your RAMdrive has enough memory.

Q: What's the difference between the different 3.5" drives which have been released by Apple?

A: In release order, they are: Macintosh 400K, Unidisk 3.5, Macintosh 800K, and Apple 3.5 drive. All of the drives are double sided, with the exception of the Mac's 400K single sided drive. The Macintosh drives are dumb, and rely on the Mac's internal disk controller card. The Unidisk 3.5 is an intelligent drive, and has a built-in Apple Smart Protocol Converter. It can be attached to a IIe, IIc, or IIgs Smartport. The Apple 3.5 drive does not

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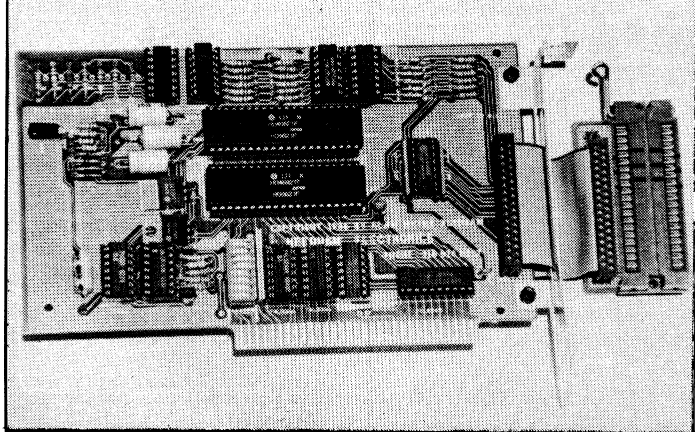

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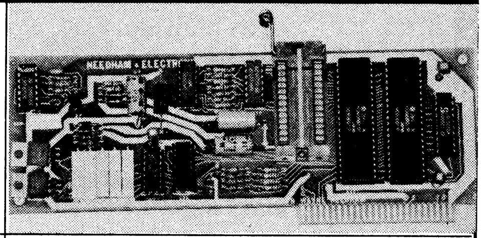

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